



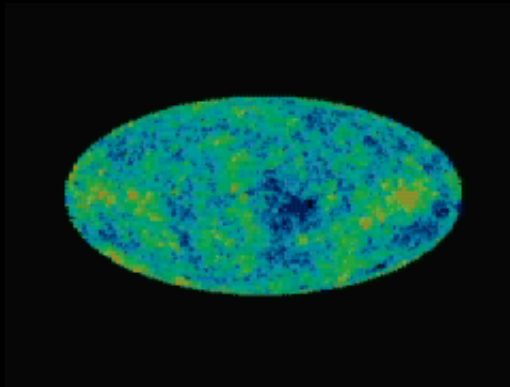
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**Presentation to the  
Sixth International LISA Symposium**

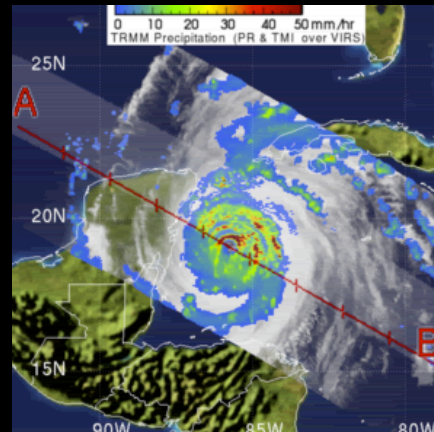
**Colleen N. Hartman  
Deputy Associate Administrator  
SMD**

**June 19, 2006**

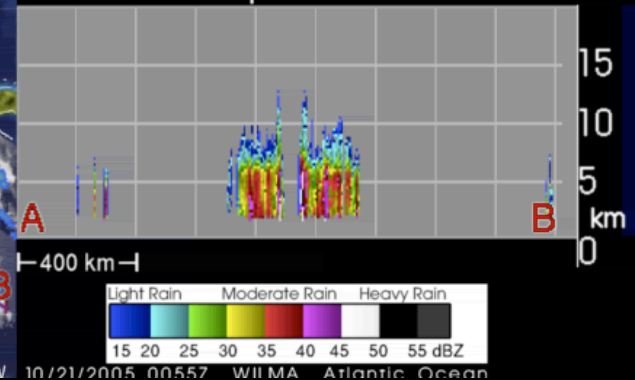
# Science Highlights



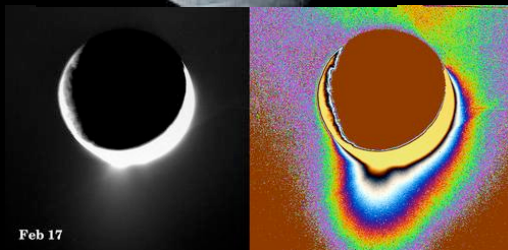
WMAP



TRMM Precipitation Radar

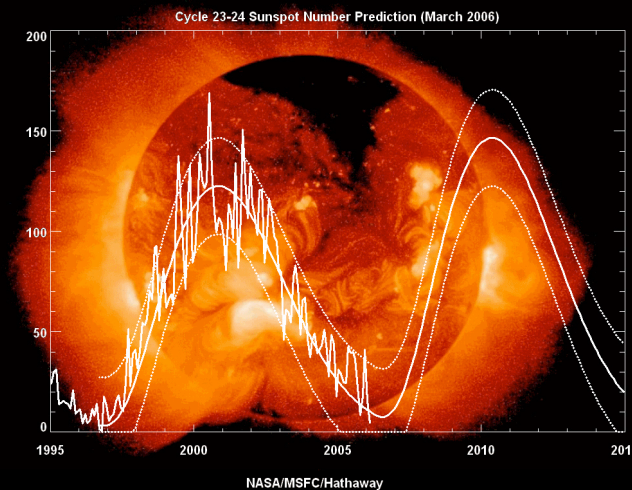


Eye of Hurricane Wilma -- TRMM

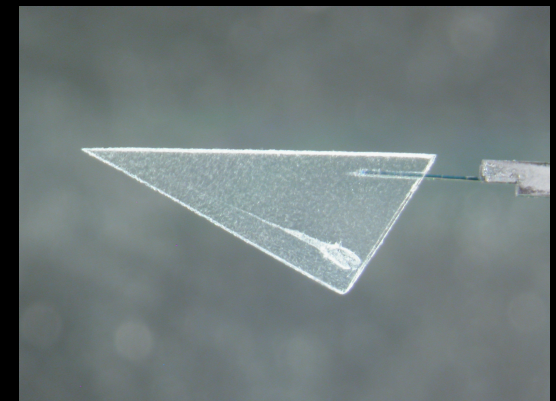


Feb 17

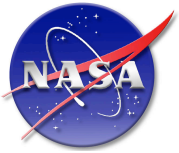
Cassini & Enceladus



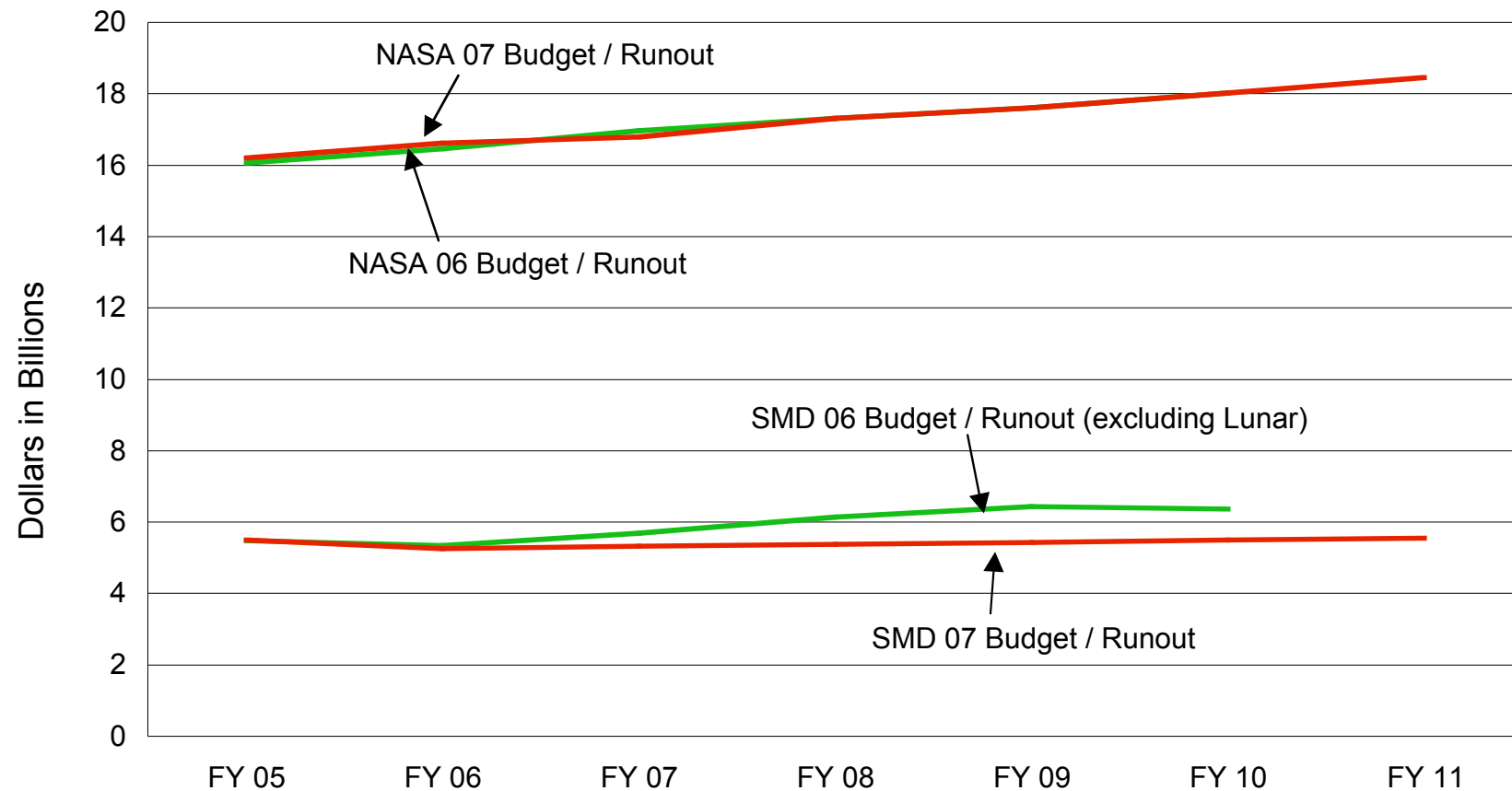
Predicting Solar Cycle Intensity  
with SOHO

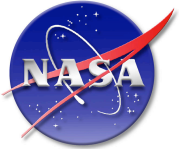


Stardust's Successful  
Comet Sample Return



## FY06 vs. FY07 Budget Comparison



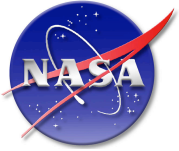


## Science Budget Strategy

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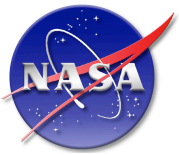
- **To support Space Operations Mission Directorate requirements within a fixed Agency budget, reductions to previous Science planning are necessary**
- **Science gets 1.5% growth from FY06 to 07, 1% per year thereafter**
  - \$3.1B decrease from FY06 Budget runout
- **Strategy for Adjustments**
  - Develop an executable program based on strategic National Academy science priorities



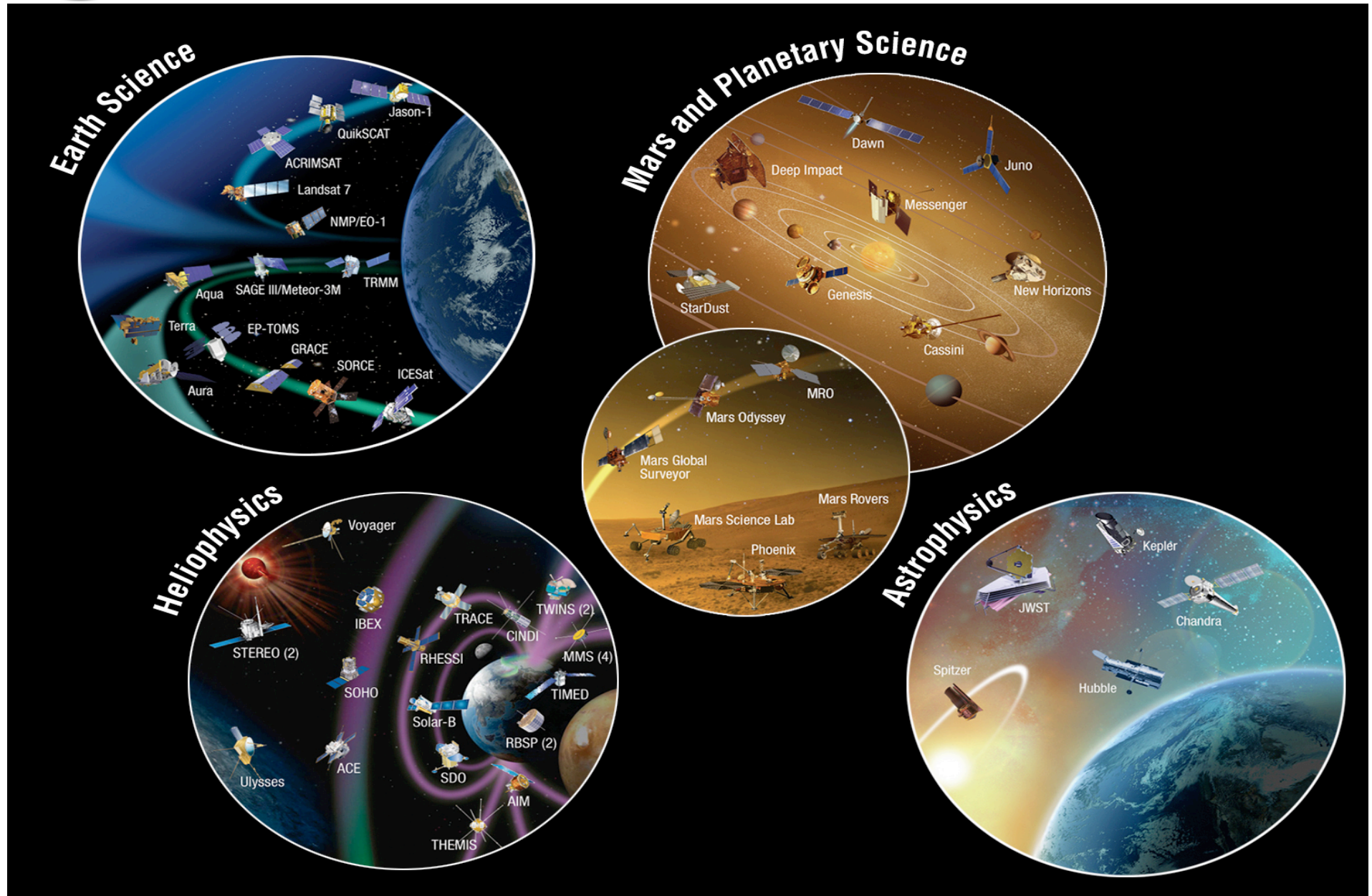


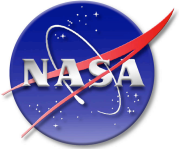
## FY07 NASA Budget (\$M)

	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11
<b><u>Total NASA</u></b>	<b><u>\$16,196.4</u></b>	<b><u>\$16,623.0</u></b>	<b><u>\$16,792.3</u></b>	<b><u>\$17,309.4</u></b>	<b><u>\$17,614.2</u></b>	<b><u>\$18,026.3</u></b>	<b><u>\$18,460.4</u></b>
<b><u>Science</u></b>	<b><u>\$5,501.6</u></b>	<b><u>\$5,253.7</u></b>	<b><u>\$5,330.0</u></b>	<b><u>\$5,383.1</u></b>	<b><u>\$5,437.1</u></b>	<b><u>\$5,491.5</u></b>	<b><u>\$5,546.4</u></b>
Solar System Exploration	\$1,720.5	\$1,582.3	\$1,610.2	\$1,598.6	\$1,840.4	\$1,899.6	\$1,846.7
The Universe	\$1,474.9	\$1,507.9	\$1,509.2	\$1,500.9	\$1,307.9	\$1,276.1	\$1,309.7
Earth-Sun System	\$2,306.2	\$2,163.5	\$2,210.6	\$2,283.7	\$2,288.9	\$2,315.8	\$2,390.0
<b><u>Exploration Systems</u></b>	<b><u>\$2,209.3</u></b>	<b><u>\$3,050.1</u></b>	<b><u>\$3,978.3</u></b>	<b><u>\$3,981.6</u></b>	<b><u>\$4,499.8</u></b>	<b><u>\$5,055.9</u></b>	<b><u>\$8,775.1</u></b>
Constellation Systems	\$422.3	\$1,733.5	\$3,057.6	\$3,067.6	\$3,612.9	\$4,083.8	\$7,698.4
Exploration Systems R & T	\$898.9	\$692.5	\$646.1	\$632.2	\$605.1	\$679.2	\$764.6
Human Systems R & T	\$888.1	\$624.1	\$274.6	\$281.8	\$281.8	\$292.8	\$312.1
Aeronautics Research	\$962.0	\$884.1	\$724.4	\$731.8	\$732.4	\$722.8	\$722.7
<b><u>Space Operations</u></b>	<b><u>\$7,114.4</u></b>	<b><u>\$6,869.7</u></b>	<b><u>\$6,234.4</u></b>	<b><u>\$6,680.4</u></b>	<b><u>\$6,442.3</u></b>	<b><u>\$6,242.9</u></b>	<b><u>\$2,896.7</u></b>
Space Shuttle	\$5,049.2	\$4,777.5	\$4,056.7	\$4,087.3	\$3,794.8	\$3,651.1	\$146.7
International Space Station	\$1,591.3	\$1,753.4	\$1,811.3	\$2,200.3	\$2,255.6	\$2,197.1	\$2,360.8
Space and Flight Support (SFS)	\$473.9	\$338.8	\$366.5	\$392.8	\$392.0	\$394.7	\$389.2
Inspector General	\$31.3	\$32.0	\$33.5	\$34.6	\$35.5	\$36.4	\$37.3
<b><u>Cross-Agency Support Programs</u></b>	<b><u>\$377.8</u></b>	<b><u>\$533.5</u></b>	<b><u>\$491.7</u></b>	<b><u>\$497.9</u></b>	<b><u>\$467.1</u></b>	<b><u>\$476.8</u></b>	<b><u>\$482.2</u></b>
Education Theme	\$178.9	\$162.4	\$153.3	\$152.4	\$153.1	\$154.0	\$153.3
Advanced Business Systems (IEMP)	\$0.0	\$156.3	\$108.2	\$106.9	\$73.8	\$78.5	\$80.6
Innovative Partnership Programs	\$198.9	\$214.8	\$197.9	\$205.5	\$206.2	\$209.7	\$212.9
Shared Capability Assets Program	\$0.0	\$0.0	\$32.2	\$33.1	\$33.9	\$34.7	\$35.5



## 57 Missions Currently in Operation





## FY07 Budget Implications

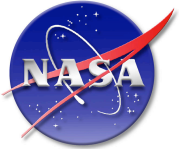
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### What's Changed:

- Replan of Beyond Einstein Program to determine which mission is (LISA, Con-X and JDEM) first to proceed.
- SIM LRD NET 2015/2016; TPF deferred; Keck Outriggers cancelled.
- JWST cost estimates incorporated for 2013 LRD.
- HST SM-4 scheduled for December 2007.
- SOFIA cleared to proceed pending identification of funding.
- GLAST completed a schedule/cost rebaseline, mainly due to LAT development problems; LRD no-earlier-than September 2007.
- Kepler confirmation baseline established
- WISE confirmation review completed; project stays in formulation until decision can be made on proceeding to development.
- R&A funding reduced approximately 15%.
- Herschel and Planck budgets adjusted to reflect changes in schedule.

### What's Stayed the Same:

- Chandra operations and data analysis will continue through 2011.
- Spitzer operations will continue through lifetime of cryogenic mission.
- Maintain support for NASA work associated with Herschel and Planck.



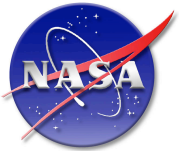
## Recommendations from the AAAC

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From the March 2006 Annual Report:

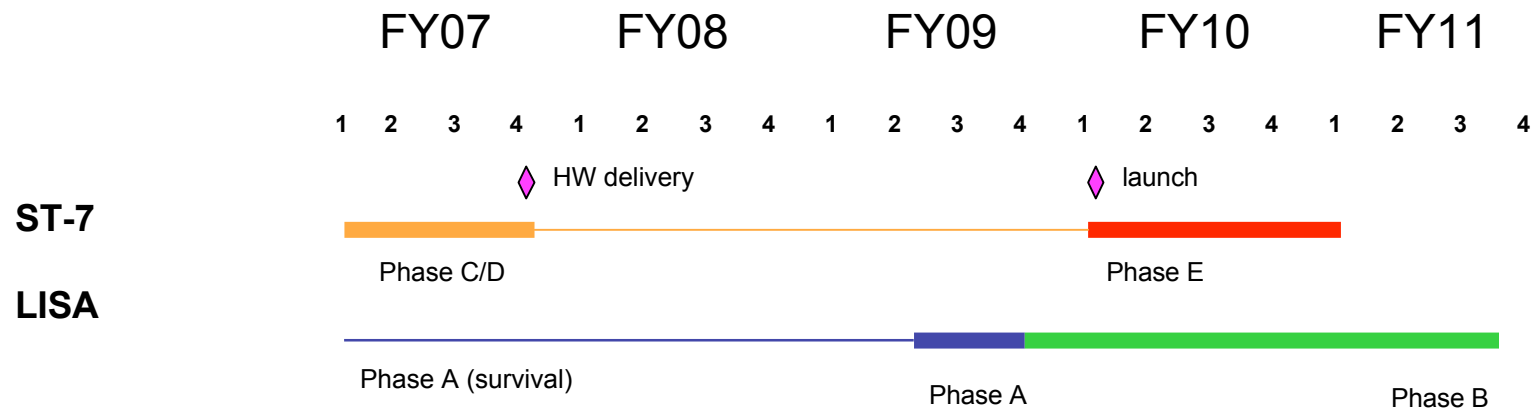
Agency Recommendation - The AAAC strongly recommends that the conceptual and technology development funding for missions such as Con-X, LISA, and TPF be increased to at least ~10M per year.

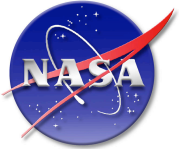
The Beyond Einstein Program - The AAAC recommends that NASA look carefully at providing resources at the \$10M or greater level for continuing a modest level of technology readiness and provided with reliable cost estimates in the upcoming Decadal Survey.



# ST7 and LISA

- ST7 brings the *least well-tested* LISA instrumentation, DRS, to TRL level 9
- *Preparations* for 2010 launch will already greatly enhance
  - Experience in building flight models
  - Experience in tightly-coupled NASA/ESA cooperation
- Results from 2010 launch will be in time to inform formulation

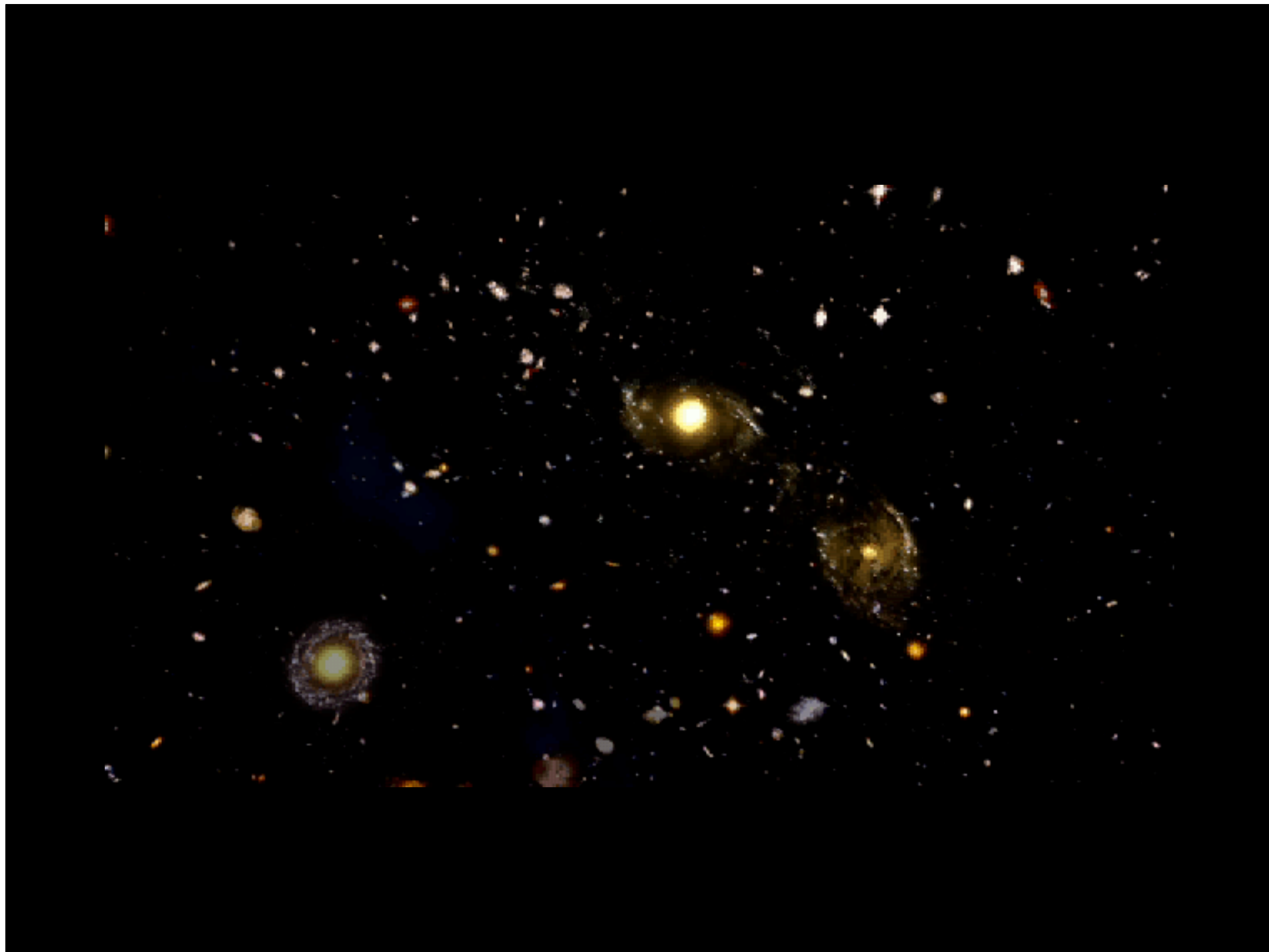




## LISA Decision

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- Budget requirements have necessitated Beyond Einstein be sequential missions rather than parallel efforts
- Funding wedge for first BE mission start in 2009
- One of 3 will go first: LISA, Con-X, JDEM
- Special BE NRC panel in 2008-9

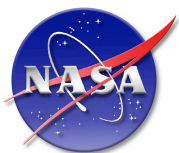




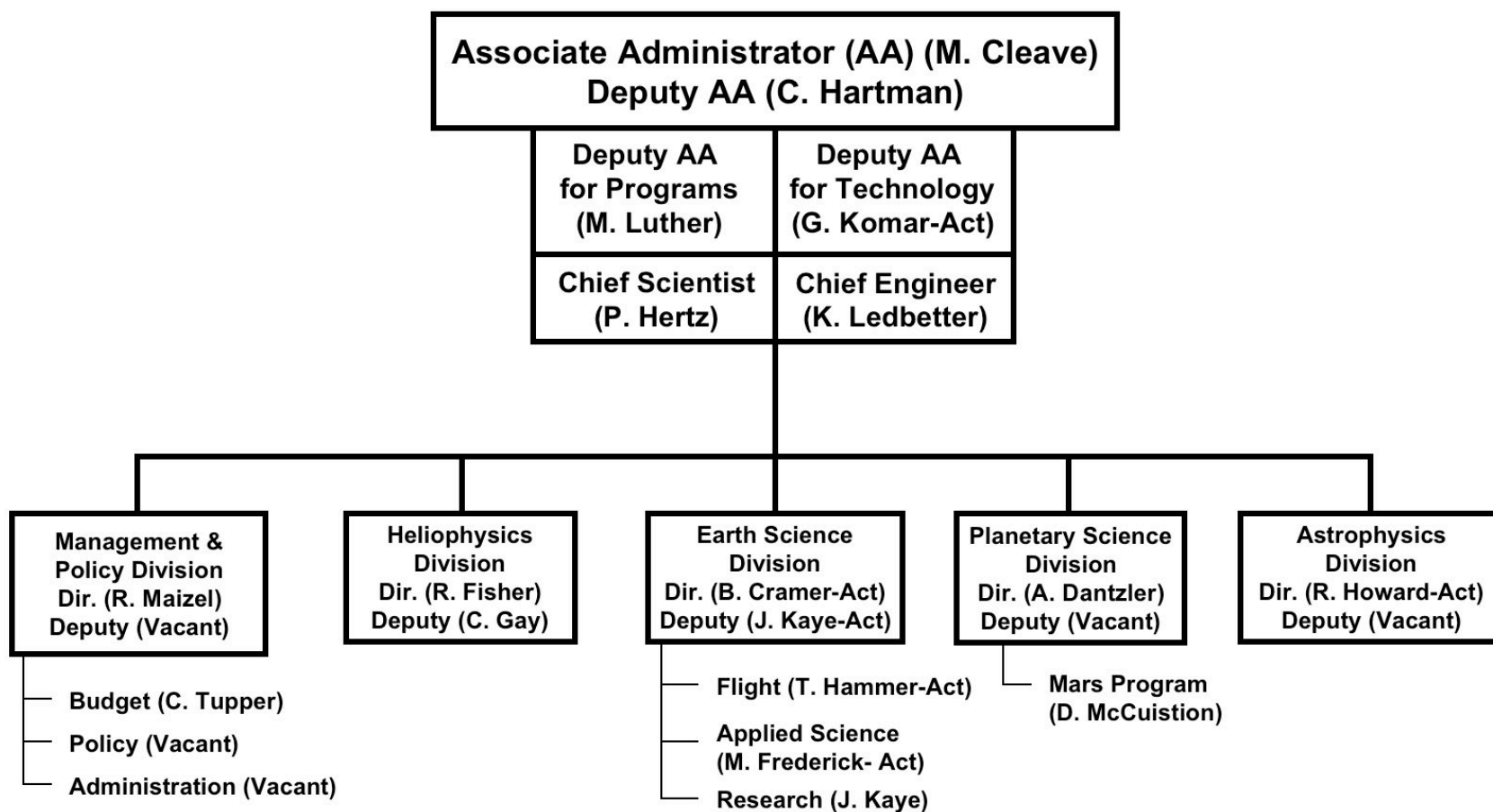
## BACKUP

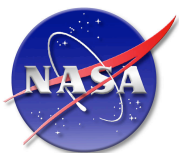
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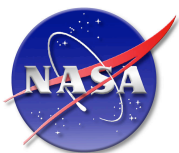
# Science Mission Directorate Organization Chart





## Content of FY07 President's Budget

	FY06	FY07	FY08	FY09	FY10	FY11
FY 07 President's Budget	1,507.9	1,509.2	1,500.9	1,307.9	1,276.1	1,309.7
Navigator	145.5	128.1	170.6	276.9	261.6	347.0
SIM	117.0	98.5	139.0	236.2	222.5	302.2
Keck Interferometer / Single Aperture	9.6	10.2	9.6	8.4	7.0	7.0
TPF	3.4					
Corporate / Other	15.5	19.4	22.0	32.3	32.1	37.8
James Webb Space Telescope	364.0	443.1	492.6	380.9	353.0	305.0
Hubble Space Telescope	268.6	336.7	302.2	161.4	120.3	138.5
Development	166.5	216.2	178.9	55.0	45.4	45.7
Operations and Data Analysis	87.0	102.0	106.0	97.0	68.0	85.0
Corporate	15.1	18.5	17.3	9.4	6.9	7.8
Stratospheric Observatory for Infrared Astronomy (SOFIA)	48.0					
Gamma-ray Large Space Telescope (GLAST)	125.9	85.4	25.2	28.8	29.3	30.4
Discovery (Kepler / Corporate)	137.5	100.8	69.9	13.8	13.4	13.0
Explorer (Universe)	85.4	67.6	86.1	56.7	19.0	4.6
WISE	69.7	53.9	71.7	44.8	8.8	4.3
Swift, Suzaku	10.9	10.0	9.5	8.6	9.1	
Corporate	4.8	3.7	4.9	3.3	1.1	0.3
Universe Research	305.8	306.6	309.2	297.4	288.9	259.6
Research and Analysis	65.1	54.4	54.0	56.0	53.9	55.9
Chandra	58.4	63.0	65.1	64.7	65.1	65.0
Spitzer	74.3	76.6	75.7	71.7	66.4	35.9
Other Missions / Data	68.1	71.2	70.8	59.2	58.4	59.2
Balloons	22.8	24.5	25.8	28.5	28.8	29.0
Corporate / Other	17.1	16.9	17.8	17.3	16.3	14.6
ISSC (Herschel / Planck)	13.0	19.6	23.6	38.9	38.5	36.3
Beyond Einstein	14.1	21.2	21.4	53.0	152.2	175.4

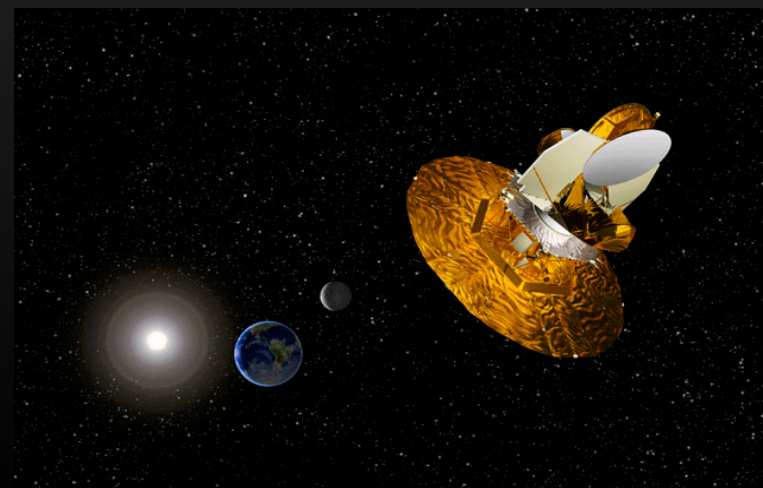
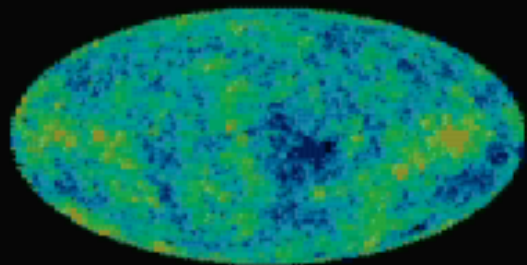
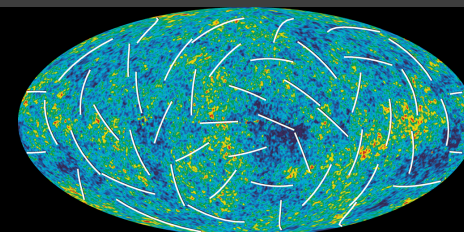
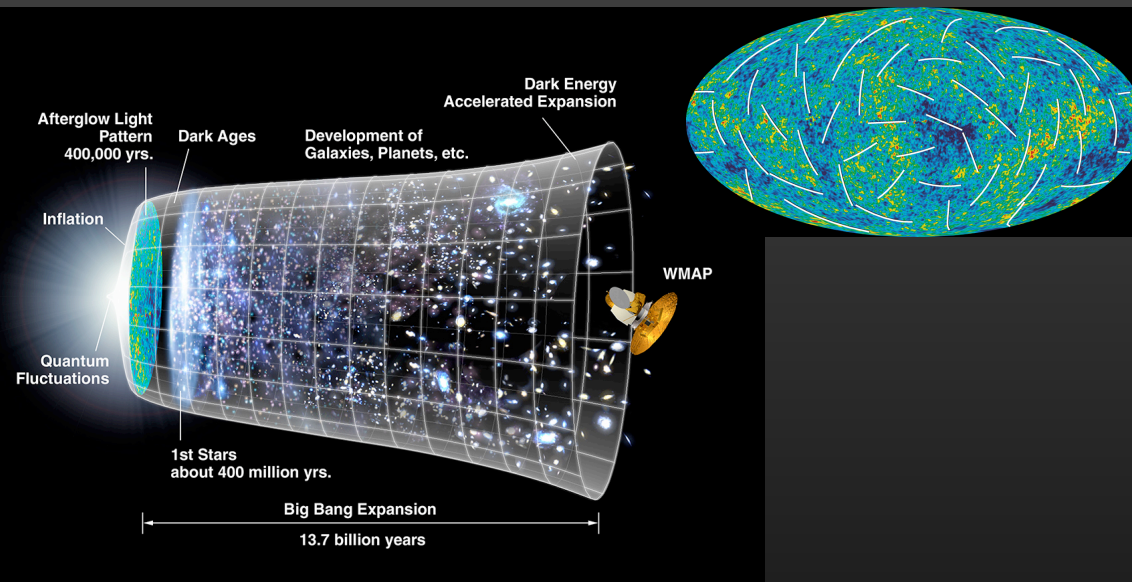


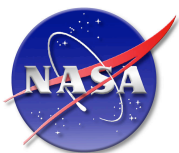
## Budget Comparison by Theme

	FY06	FY07	FY08	FY09	FY10	FY11	Total Changes
<b>Total Science</b>							
FY 06 President's Budget, excluding Lunar	5,341.7	5,684.2	6,132.0	6,436.8	6,370.7		
FY 07 President's Budget	5,253.7	5,330.0	5,383.1	5,437.1	5,491.5	5,546.4	
Changes	-88.0	-354.2	-748.9	-999.7	-879.2		-3,070.0
<b>Earth-Sun Systems</b>							
FY 06 President's Budget	2,063.6	2,081.2	2,132.2	2,359.0	2,324.8		
FY 07 President's Budget	2,163.5	2,210.6	2,283.7	2,288.9	2,315.8	2,390.0	
Changes	99.9	129.5	151.5	-70.2	-9.0		301.8
<b>Solar System Exploration</b>							
FY 06 President's Budget, excluding Lunar	1,765.9	2,071.5	2,460.5	2,582.7	2,639.2		
FY 07 President's Budget	1,582.3	1,610.2	1,598.6	1,840.4	1,899.6	1,846.7	
Changes	-183.6	-461.4	-861.9	-742.4	-739.6		-2,988.8
<b>The Universe</b>							
FY 06 President's Budget	1,512.2	1,531.5	1,539.4	1,495.0	1,406.7		
FY 07 President's Budget	1,507.9	1,509.2	1,500.9	1,307.9	1,276.1	1,309.7	
Changes	-4.3	-22.3	-38.5	-187.2	-130.6		-382.9



# WMAP





## Astrophysics Missions

Mission	Launch	06 IBPD	Phase	End of Prime
HST	Apr-90	same	Implementation - Extended Operations	Apr-05
RXTE	Dec-95	same	Implementation - Extended Operations	Jan-98
FUSE	Jun-99	same	Implementation - Extended Operations	Mar-03
Chandra	Jul-99	same	Implementation - Extended Operations	Jul-04
XMM	Dec-99	same	Implementation - Extended Operations	Dec-04
HETE-2	Oct-00	same	Implementation - Extended Operations	Oct-01
WMAP	Jun-01	same	Implementation - Extended Operations	Sep-03
Integral	Oct-02	same	Implementation - Extended Operations	Sep-04
GALEX	Apr-03	same	Implementation - Extended Operations	Aug-05
Spitzer	Aug-03	same	Implementation - Prime Operations	May-06
Gravity Probe - B	Apr-04	same	Implementation - Post-Op Data Analysis	Sep-05
Swift	Nov-04	same	Implementation - Prime Operations	Jan-07
Astro-E2	Jul-05	same	Implementation - Prime Operations	Feb-08
Herschel	Jul-07	same	Implementation - Development	
Planck	Jul-07	same	Implementation - Development	
GLAST	Sep-07	May-07	Implementation - Development	
HST SM-4	NET Dec-07	robotic	Implementation - Development	
Kepler	Jun-08	TBD	Implementation - Development	
WISE	Jun-09	Aug-08	Implementation - Development	
JWST	Jun-13	Aug-11	Formulation	
SIM	2015-2016	Oct-12	Formulation	
LISA	TBD	Sep-13	Formulation	
Con-X	TBD	n/a	Pre-Formulation	
JDEM	TBD	n/a	Pre-Formulation	
TPF	n/a	n/a	delayed indefinitely	
SOFIA	n/a	Aug-06	under review	